Spring 2017

Varying Perspectives on Landscape Diversity

Benet Kinghorn
University of Nebraska Lincoln

Varying Perspectives on Landscape Diversity

By Benet Kinghorn

An Undergraduate Thesis

Presented to

The Environmental Studies Program at the University of Nebraska-Lincoln

In Partial Fulfillment of Requirements

For the Degree of Bachelor of Science/Arts

Majors: Environmental Studies & Horticulture

Lincoln, Nebraska

Date: 4-26-17

Objectives

People are drawn to green spaces. Landscaped spaces, especially in urban environments, provide physical and psychological benefits (A, Irivine, Devine-Wright, Warren, & Gaston, 2007). Currently 81.6 percent of the United States population lives in urban areas. As urbanization increases by 1.02 percent annually, green space within urban areas is becoming sparse (Central Intelligence Agency, 2015). It will be critical for cities to save remaining green spaces. City planners and homeowners should learn how to create functional and aesthetically pleasing green spaces to maximize increasingly limited available urban landscapes. Research shows that with more biodiversity in a particular green space, psychological and physical benefits increase (A, Irivine, Devine-Wright, Warren, & Gaston, 2007). Therefore, it will be important to incorporate biodiversity into green spaces in urban areas to provide psychological and physical benefits.

Approximately 60 percent of the United States, excluding the state of Alaska, has lost most of its natural vegetation (Stein, Kutner, & Adams, 2000). Various companies, nonprofits, and individuals are pushing for more sustainable, diverse, and environmentally friendly landscapes that will increase biodiversity and natural vegetation. Yet the green ecological industry is performing at a level far below that needed for a significant positive change in biodiverse landscapes As of April 2017, the landscape industry in the United States employs over 950,000 individuals, with expectations that the industry will continue to expand (IBIS World, 2016). The individuals employed in the current industry, and the ones that will enter it in the future, will provide the baseline for discussion and advocacy towards environmental sustainability and awareness.

Human cultivation of plant material is the best way to create diversity. A study by Elizabeth R. Hobbs found that keeping some areas of urban forests untouched is critical to

maintaining a rich biodiversity. However, it was equally important, or even more important, to introduce species to the landscape (Hobbs, 1998). Humans can play an important role in creating a more biodiverse landscape by carefully considering the contributions of additional plants to the overall landscape system.

A modest functional design is the most sustainable solution. The best way to achieve this design strategy is by analyzing the design requirements and through understanding the psychological and economic capacity of the space based on the aspects of function, material, and color (Xu & Gong, 2016). When creating landscape systems-based design overarching design, it is critical to consider social, environmental, and economic drivers. Urbanization and transition of land into monoculture stands of cash crops have caused a decrease in the overall diversity in the landscape. When designing residential homes, incorporating a greater variety of plant species can perform more ecological features. In public urban green spaces, design can offer solutions to increase biodiversity by substituting a greater array of plant varieties for plants that have been over utilized. The plant material used should perform more biological services which include storm water management, pollination, and habitat for various creatures (Lovell & Johnston, 2009).

To change the mindset and approach of the green ecological industry will be no small task. This study may start a conversation in the Lincoln, Nebraska area about what comprises a more diverse landscape. The goal of this study is to discover the varying perceptions between homeowners, industry professionals, and horticultural industry professionals about what makes a landscape biodiverse. The study should reveal what the green ecological industry and homeowners view as a biodiverse landscape and what they consider as the most important factors contributing to a biodiverse landscape. Finally, the study should reveal any similarities or differences between the two distinct groups.

Importance of Landscape Diversity

According to a survey conducted by the Harris Interactive (commissioned by the National Association of Landscape Professionals), 75 percent of Americans see spending quality time outside as important. Even 74 percent of the highly technological millennial generation consider spending time outside to be important, and 90 percent of people of all survey responses want to live in a home that is surrounded by trees or other plant material. In this particular study, the responses also stated that 90 percent of people who have their own yard agree that is important for their yard to be well maintained (Harris Interactive Inc, 2012). This survey shows that people feel a need to spend time outside, but describing or defining a well-maintained yard is more difficult.

It is important to overcome the lost diverse agricultural or native landscapes with an abundance of diverse green spaces in urban environments (Turrini & Knop, 2015). In Nebraska, which is primarily an agricultural state, it is even more important that urban areas provide a more diverse landscape because they can provide a habitat for living species that have been displaced by agriculture.

There are many reasons why biodiversity is considered as being valuable for the environment. The benefits of biodiversity can be broken down into three broad categories: ecosystem services, biological resources, and social benefits. Ecosystem services include protection, regulation, and purification of the hydrologic cycle; protection and formation of soils; cycling and nutrient storage; absorption and purification of pollution; climate stability; and the increase of recovery from disastrous events. From a biological perspective, biodiversity ensures

the production of food and medical resources, wood-based products, and wildlife habitat. Finally, social benefits include recreation, psychological improvements, aesthetics, and cultural value associated with the landscape (Commonwealth Department of the Environment, Sport and Territories, 1993). Another strong argument toward an ever more diverse landscape is the protection of the environment from various pests. Nina L. Bassuk of Cornell University explains that previous and current landscape practices have mistakenly included over-planting particular species. For instance, the over-planting of susceptible American elms resulted in massive devastation from Dutch elm disease (Bassuk, 1990).

In general, the more biodiversity that can be created, the better quality of life humans will have. Jean-Pierre L Savarda, Philippe Clergeau, and Gwenaelle Mennechez, illuminate how biodiversity has a positive impact on quality of life and human understanding about biodiversity. The authors argue that this will ultimately help to preserve and encourage an increase in diversity in landscapes (Savarda, Clergeau, & Gwenaelle, 2000).

Materials and Methods

There are few existing surveys on varying perspectives on landscape diversity. The questionnaire survey was designed using a Survey Monkey instrument under the authority of the University of Nebraska-Lincoln's department of agronomy and horticulture. The questions were designed by looking at other department surveys and working with industry professionals, and horticulture faculty. Two identical copies of the survey were created. One copy was sent out to green /ecological industry business professionals, green /ecological industry experts, and other individuals with more extensive environmental backgrounds. For purposes of the survey, a green ecological industry expert is considered to be professors or an individual with a level of education higher than a bachelor's degree in the green industry. The green ecological industry

business professionals group includes individuals working or employing people in their respective ecological career. Other individuals that have greater environmental background may include retired industry professionals and others who have spent multiple years working with the environment. The second copy was distributed to a homeowner demographic, based on home ownership. The homeowner's survey was distributed using the social media platforms of the public television show Backyard Farmer.

Once all the data was collected, this information was used to compare the perspectives between the two surveys. The comparisons were based on the findings of the statistical analysis in a chi squared test and T test. Comparisons were based on the null hypothesis that the two groups were propositionally equal. The null hypothesis was rejected if the p-value was less than 0.05.

Results

Total survey participation for both surveys equaled 506 participants. Of the 506 participants, 179 individuals took the homeowner survey and 327 individuals took the professional survey. Figures 1 and 2 represent the education and experience for each survey group. The remainder of the demographics collected can be seen in the appendix.

Figure 1:

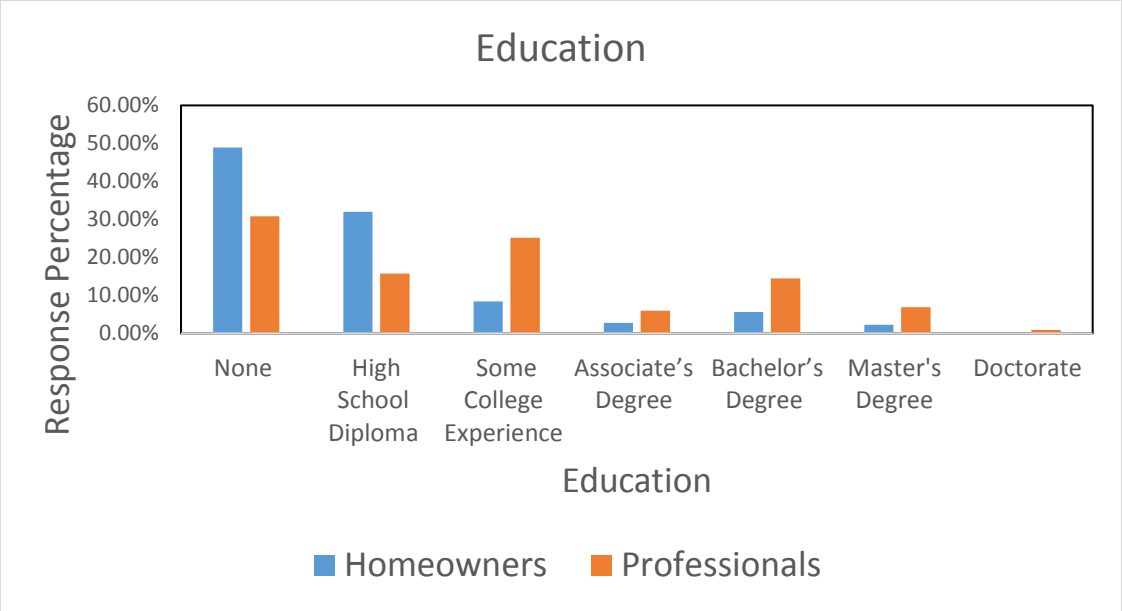

Figure 1 shows that statistically by percentage professionals have higher education in fields related to the green ecological industry than homeowners.

Figure 2

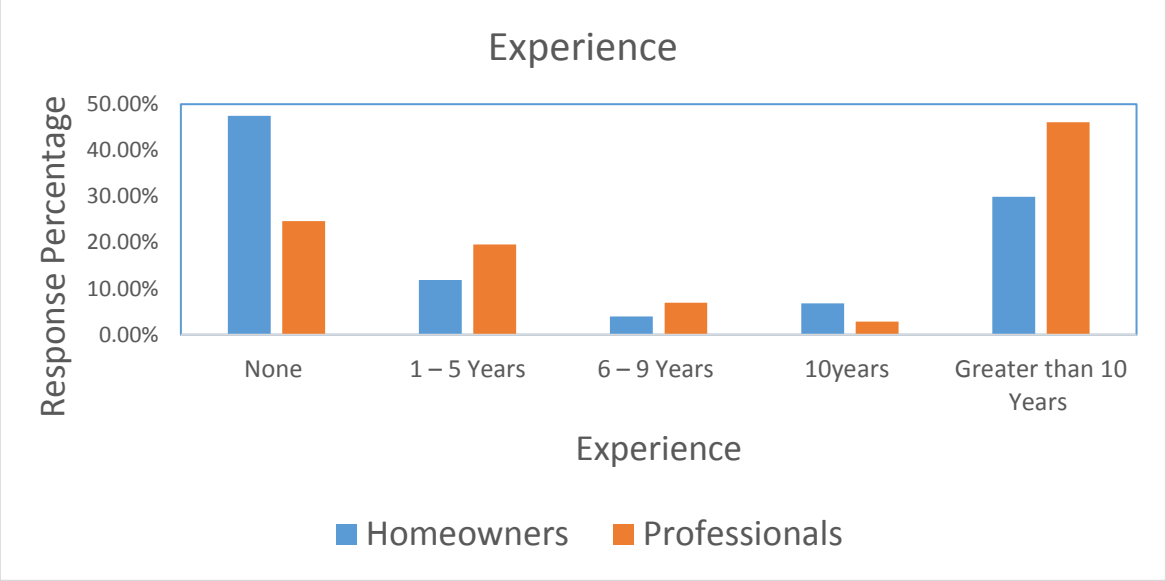

Figure 2 represents the experience level of homeowners and professionals. Forty-six percent of professionals have greater than ten years of experience, compared to thirty percent for the homeowners.

Figure 3:

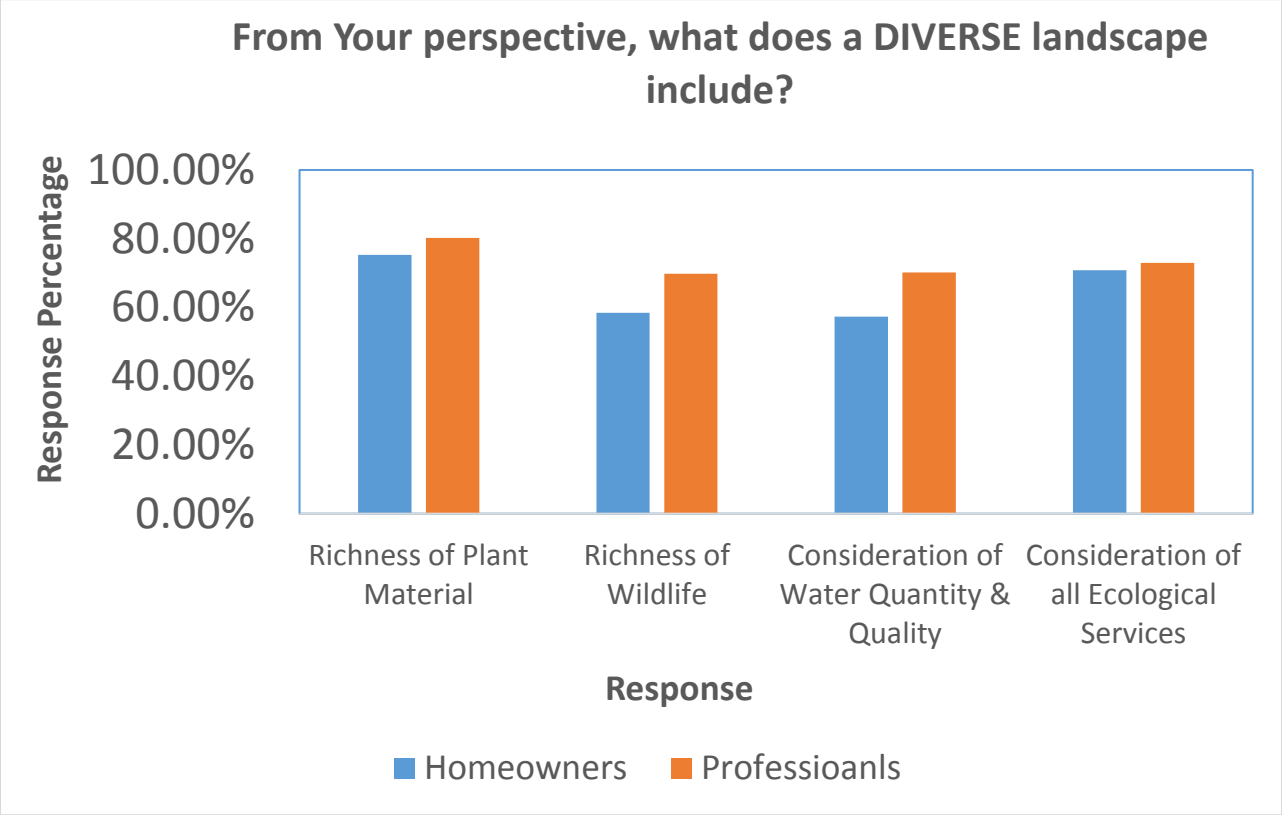

Figure 3 demonstrates statistically that professionals see richness of wildlife and consideration of water quantity and quality being included in a diverse landscape of greater importance as compared to homeowners. The p value equaled 0.0104 for richness of wildlife and 0.004 for consideration of water quantity and quality.

Figure 4:

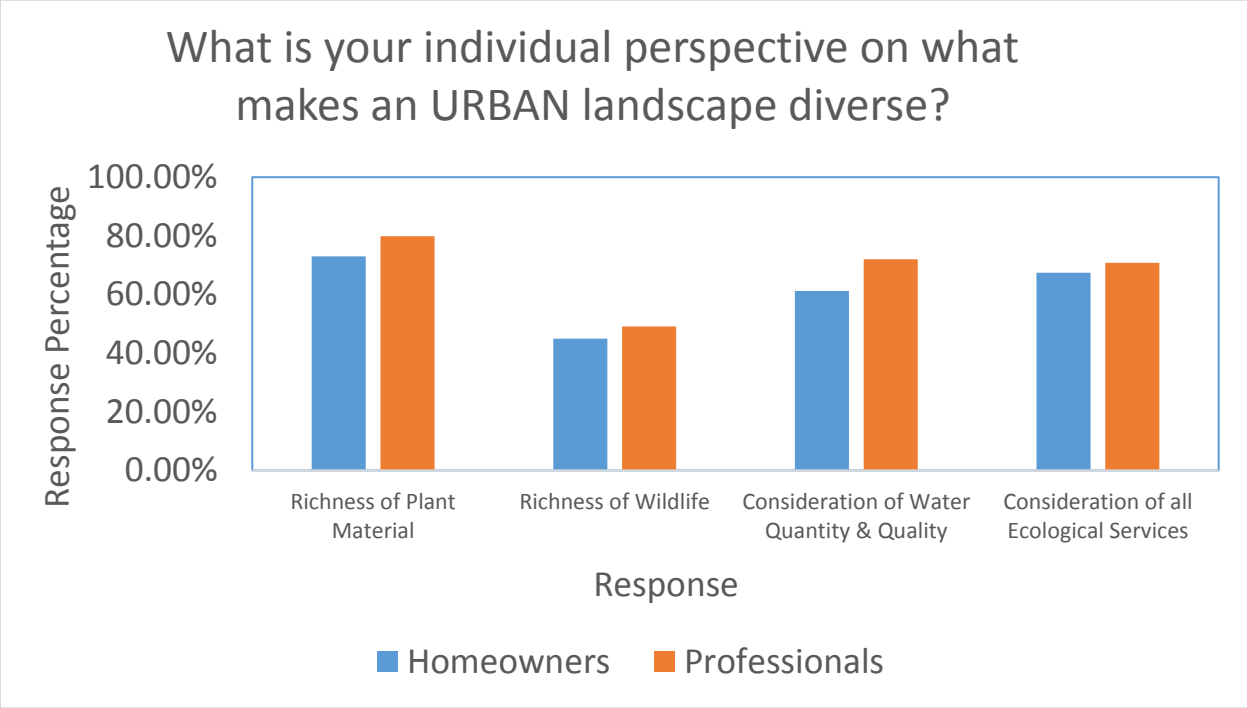

Figure 4 statistically illustrates professionals see consideration of water quantity and quality as being included more often in a diverse urban landscape. The p-value for this response equals 0.0135.

Figure 5

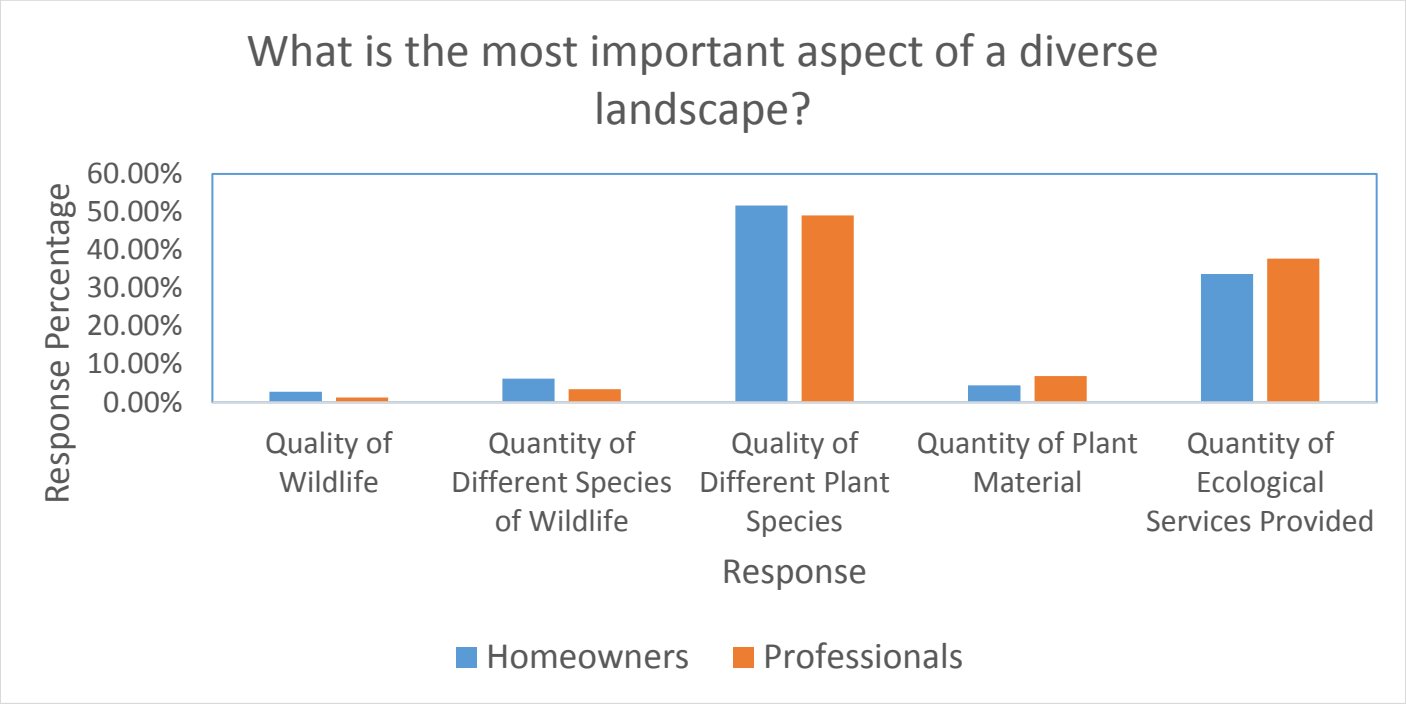

Figure 5 statistically represents that both homeowners and professionals agree on what is the most important aspect of a diverse landscape. Quality of different plant species, by percentage, was the response most frequently selected. Fifty-two percent of homeowners selected this response. Forty-nine percent of professionals selected this response as well.

Image A

Image B

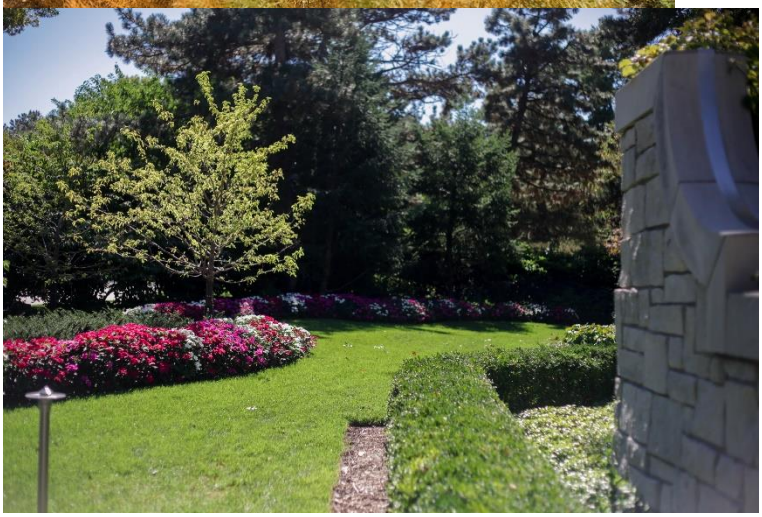

Image C

Image A, B, and C was used in two questions. The two questions include “which of these landscapes are the most diverse” and “which of these landscapes are the least diverse.” The image were provided by Kinghorn Gardens, Inc.

Figure 6

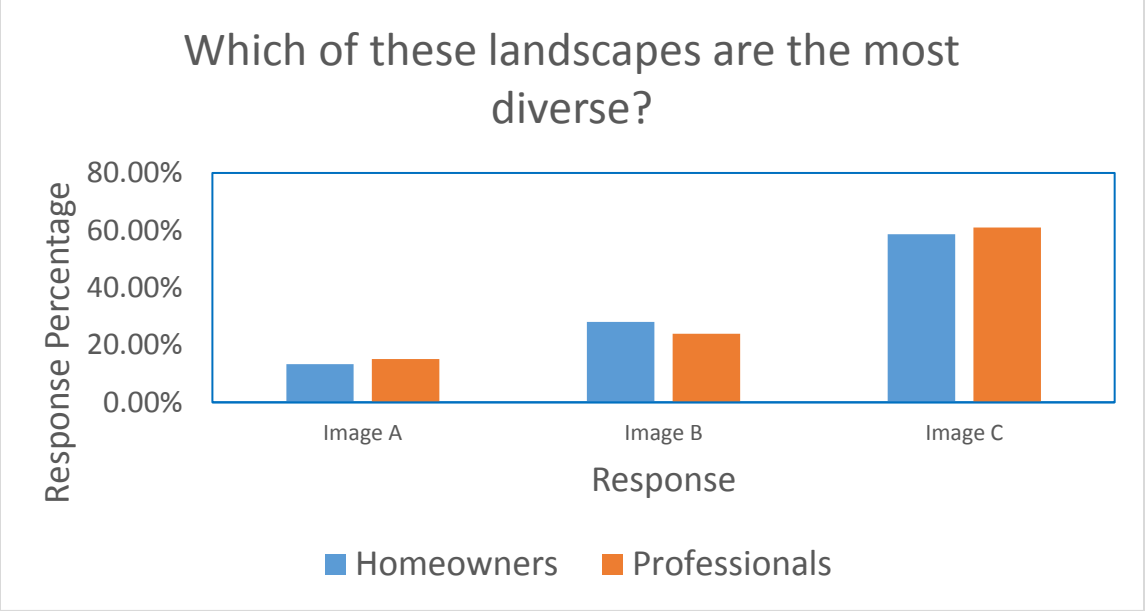

Figure 6, by percentage, shows that both survey groups view Image C as being the most diverse. Homeowners selected Image C at a rate of fifty-nine percent. Professionals selected Image C at sixty-one percent.

Figure 7

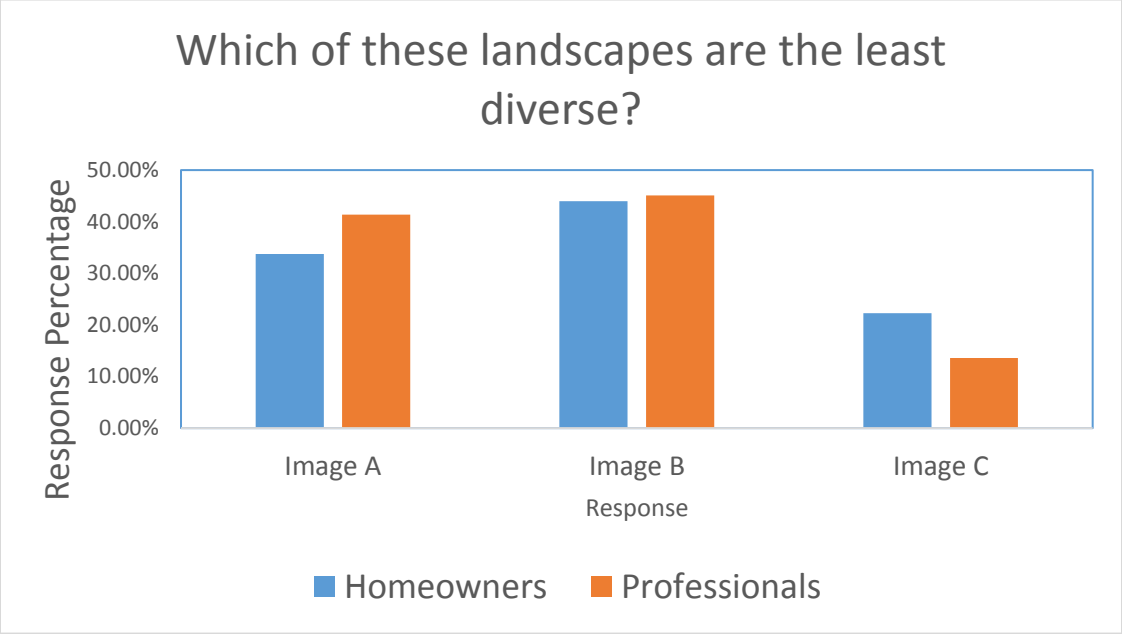

Figure 7, by percentage, shows that both survey groups view Image B as being the most diverse. Homeowners selected Image B at a rate of fifty-four percent. Professionals selected Image C at a rate of forty-five percent. Statistically, Image C had a p value equal to 0.0175 suggesting that more homeowners selected this image.

Discussion

The data produced from this survey indicates that there are similarities and varying perspectives on landscape between the two survey groups. First, the survey as illustrated in Figure 5 indicates that both homeowners and professionals trend toward the quality of plant material as being the most important aspect of a diverse landscape. This result demonstrates that both homeowners and professionals understand the importance the quality of plant material has in the landscape. Thus, this knowledge could help to reverse the approximately 60 percent of the United States, excluding the state of Alaska, that has lost most of its natural vegetation (Stein, Kutner, & Adams, 2000). Future research could explore **why** the two survey groups consider the quality of the plant material as the most important aspect of a diverse landscape. A second research question could focus on whether diverse, quality plant material is being used in effectively in the landscape.

Next, the survey as represented in Figure 3 indicates that statistically professionals see that richness of plant material and wildlife, consideration of water quantity and quality, and consideration of all ecological services equate to more diverse in non-urban landscapes. Homeowners concluded that these landscape attributes are not as important to include in a diverse landscape. Figure 3 proves that there are differences in perspectives about what constitutes a diverse landscape, especially in an urban environment. However, a conclusion cannot be made about why each group selected this response. The survey does show that professionals tend to see landscape on a more holistic level by considering all the ecological services that a diverse landscape can provide. As indicated in figure 1 homeowners without the higher educational background in green ecological industry fields may take a more narrow approach to diversity. The benefits as described by the Commonwealth Department of the

Environment show that landscape diversity is more inclusive and broader than the one or two selections homeowners perceive as an aspect of landscape diversity.

The survey data also reflected that both survey groups ranked Image C as the most diverse landscape (Figure 6). Figure 7 reflects the data that both survey groups selected Image B as the least diverse. However, the P-Value was significantly less than 0.05 for Image C, thus rejecting the null hypothesis. This indicates there is a significant difference between homeowners and professionals in understanding or choosing images that represent diverse landscapes. The survey data indicated that both groups have similar perceptions regarding the selection of the least and most diverse landscapes. However, statistically the homeowner group does not have the total understanding of the group.

Conclusion

Homeowners and professionals have varying perspectives on landscape diversity as represented in Figures 3, 4, and 7. The survey also showed that in some cases both survey groups had similar thoughts on what defines diverse landscape; this is evident in Figures 5 and 6. The variation in the responses from both survey groups proves that there are varying perspective on landscape diversity between professionals and homeowners but the perspective of homeowners may not be as different as concluded. This research is the proof of concept or first step in the creation of a baseline to quantify what individuals would include in a diverse landscape. At this point in the research the survey only proves that there are varying perspectives on landscape diversity. The next step is to apply this research to another question, such as "Psychological Benefits of Greenspace Increase With Biodiversity" and use it to create a study to determine what these survey groups quantify as the benfits of a diverse landscape. An additional future study should explore the value of utilizing diverse landscapes in an urban environment. If I were

to have done something differently in this study it would have been to expand the research beyond f discovering just that there are varying perspectives and ask research questions related to how individuals in each study group understand the actual benefits of a diverse landscape.

Appendix

Summary Statistics of Demographic Questions

Question	Response	Overall	Homeowners	Professionals
Age	1 (18 – 24 years old)	6.31%	0%	9.81%
	2 (25 – 34 years old)	8.76%	12.00%	6.96%
	3 (35 – 44 years old)	9.78%	19.43%	4.43%
	4 (45 – 54 years old)	15.07%	21.71%	11.39%
	5 (55 – 64 years old)	29.94%	30.86%	29.43%
	6(65 – 74 years old)	26.27%	16.00%	31.96%
	7 (75 years or older)	3.87%	0%	6.01%
Experience	0 (N/A)	32.79%	47.46%	24.61%
	1 (1-5 years)	16.80%	11.86%	19.56%
	2 (6-9 years)	5.87%	3.95%	6.94%
	3 (10 years)	4.25%	6.78%	2.84%
	4 (Greater than 10 years)	40.28%	29.94%	46.06%
Education	0 (N/A)	37.30%	48.88%	30.82%
	1 High School Diploma	21.57%	32.02%	15.72%
	2 Some College Experience	19.15%	8.43%	25.16%
	3 Associate's Degree	4.84%	2.81%	5.97%
	4 Bachelor's Degree	11.29%	5.62%	14.47%
	5 Master's Degree	5.24%	2.25%	6.92%
	6 Doctorate	0.60%	0%	0.94%
Outdoor Interest	1 (Gardener)	46.65%	51.41%	43.99%
	2 (Educator)	4.87%	2.82%	6.01%
	3 (Arborist)	1.62%	0.56%	2.22%

	4 (Enthusiast)	27.99%	31.64%	25.95%
	5 (Employee)	1.62%	1.69%	1.58%
	6 (Employer)	2.43%	1.69%	2.85%
	7 (Environmental Professional)	4.06%	1.13%	5.70%
	8 (Landscape design/ architecture)	4.67%	3.95%	5.06%
	9 (landscape manager)	2.64%	1.13%	3.48%
	10 (nursery professional)	2.64%	1.69%	3.16%
	11 (other)	0.81%	2.26%	0%

Summary Statistics and Comparisons of Homeowners and Professionals

Question	Response	Overall	Homeowners	Professionals	Difference	p-value
Q5 (What does a diverse landscape include?)	A	78.43%	75.28%	80.19%	0.0491	0.2024
	B	65.73%	58.43%	69.81%	0.1138	0.0104
	C	65.52%	57.30%	70.13%	0.1282	0.0040
	D	72.18%	70.79%	72.96%	0.0217	0.6050
Q6 (What makes an urban landscape diverse)	A	77.42%	73.03%	79.87%	0.0684	0.0805
	B	47.58%	44.94%	49.06%	0.0411	0.3790
	C	68.15%	61.24%	72.01%	0.1078	0.0135
	D	69.56%	67.42%	70.75%	0.0324	0.4520
Q7 When urban landscapes are designed, what do you think is the most common reason for failure when it comes to biodiversity?	A	44.56%	37.08%	48.74%	0.1166	0.0122
	B	53.02%	50.00%	54.72%	0.0472	0.3127

	C	26.01%	23.03%	27.67%	0.0464	0.2586
	D	15.52%	14.04%	16.35%	0.0231	0.4961
	E	14.92%	12.92%	16.04%	0.0312	0.3501
	F	13.31%	14.04%	12.89%	-0.0115	0.7171
	G	31.05%	32.58%	30.19%	-0.0240	0.5802
	H	24.40%	19.66%	27.04%	0.0738	0.0664
Q9 (What is the most important aspect of a diverse landscape?)	A	1.81%	2.81%	1.26%	-0.0155	0.2145
	B	4.44%	6.18%	3.46%	-0.0272	0.1580
	C	50.0%	51.69%	49.06%	-0.0263	0.5744
	D	6.05%	4.49%	6.92%	0.0242	0.2774
	E	36.29%	33.71%	37.74%	0.0403	0.3708
Q10 (In a diverse landscape, is it more important to have a greater number of species or greater number of ecological services?)	Mean	52.70	50.81	53.77	2.9580	0.1722
Q11 (Which of these landscapes are the most diverse?)	A	14.54%	13.33%	15.15%	0.0182	0.6066
	B	25.28%	28.00%	23.91%	-0.0409	0.3470
	C	60.18%	58.67%	60.94%	0.0228	0.6425
Q12 (Which of these landscapes are the least diverse?)	A	38.72%	33.76%	41.36%	0.0760	0.1144
	B	44.69%	43.95%	45.08%	0.0114	0.8171
	C	16.59%	22.29%	13.56%	-0.0873	0.0175

Question 8 is not listed because it is a free response question.

Bibliography

A, F. R., Irivine, K. N., Devine-Wright, P., Warren, P. H., & Gaston, K. J. (2007). Psychological Benefits of Greenspace Increase With Biodiversity. *Biology Letters*, 390-394.

Bassuk, N. L. (1990). Street Tree Diversity Making Better Choices for Urban Landscape. *Metria 7*, (pp. 71-78). Lisle.

Central Intelligence Agency. (2015). *Urbanization*. Retrieved from CIA:World Fact Book .

Commonwealth Department of the Environment, Sport and Territories. (1993). *Biodiversity and its Value.* Retrieved from Australia Department of the Enirоment: http://www.environment.gov.au/archive/biodiversity/publications/series/paper1/why.html

Harris Interactive Inc. (2012). *National Survey on Consumer Spending on Landscape Services.* Harris Interactive Inc.

Hobbs, R. E. (1998). Species Richness of Urban Forest Patches and Implications for Urban Landscape Diversity. *Landscape Ecology*, 141-152.

IBIS World . (2016). *Landscaping Services in the US: Market Research Report.* IBIS World.

Lovell, S. T., & Johnston, D. M. (2009). Designing Landscapes for Performance Based on Emerging Principles in. *Ecology and Society* .

Savarda, L. J.-P., Clergeau, P., & Gwenaelle, M. (2000). Biodiversity Concepts and Urban Ecosystems. *Landscape and Urban Planning*, 131-142.

Stein, B. B., Kutner, L. J., & Adams, J. J. (2000). *Precious Heritage: The Status of Biodiversity in the United States.* New York: Oxford University Press.

Tagliafierro, C., Boeri, M., Longo, A., & Hutchinson, W. (2016). Stated Preference Methods and Landscape Ecology Indicators: An Example of Transdisciplinarity in Landscape Economic Valuation. *Ecological Economics*, 11-22.

Turrini, T., & Knop, E. (2015). A Landscape Ecology Approach Identifies Important Drivers of Urban Biodiversity. *Global Change Biology*, 1652-1667.

Xu, K., & Gong, j. (2016). Landscape Design Method of Sustanable Development Based on the Modest Principle. *Agricultural Science & Technology*, 717-720.